Cathleen A. Massey
Vice President, Regulatory
Affairs and Public Policy
cathy.massey@clearwire.com
202.351-5033

clearwire

1250 I St., N.W., Suite 901
Washington, D.C. 20005

October 19, 2012

Via Electronic Filing
Ms. Marlene H. Dortch, Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, DC 20554

Notice of Oral *Ex Parte* and Submission of Written Material Communication

RE: **RE: Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands: WT Docket No. 03-66, RM-11614**

Dear Ms. Dortch:

On October 18, 2012, on behalf of Clearwire Corporation ("Clearwire"), Pete Gelbman, James Cornelius, Nadja Sodos-Wallace and I met with the following members of the Wireless Telecommunications Bureau: Stephen Buenzow, Chris Helzer, Tom Peters, John Schauble, Blaise Scinto, Melissa Tye, Nancy Zaczek and Stephen Zak. During the course of the meeting, Clearwire presented its views regarding the proceeding referenced above and proposed a further modification to the changes to Section 27.53(m) (see attached presentations for modification) of the Commission's rules previously proposed by the Wireless Communications Association International ("WCAI") and put out for comment in the Commission's Fourth Further Notice of Proposed Rulemaking in the above-captioned proceeding. Clearwire distributed to those in attendance copies of the two attached presentations.

In its October 22, 2010 Petition for Rulemaking ("WCAI PFR"), WCAI asked that the Commission amend its rules governing out-of-band-emission (OOBE) limits for mobile digital stations in the 2.5 GHz band to accommodate the use of the wider channel bandwidths. Specifically, WCAI asked that the Commission relax slightly the OOBE limits for mobile digital stations in section 27.53(m)(4) from 43 + 10 log (P) dB to 40 + 10 log (P) dB at the channel edges, and impose a 43 + 10 log (P) dB attenuation factor beyond 5MHz from the channel edges, and a 55 + 10 log (P) dB attenuation factor at "X" MHz from the channel edges where "X" is the greater of 6 MHz and the actual channel bandwidth. WCAI also requested that the Commission allow a resolution bandwidth of 2 percent for mobile digital stations in section 27.53(m)(6). Pursuant to the modification proposed by Clearwire at the meeting, the OOBE relaxation proposed by WCAI would be implemented except at the lower band edge (below 2496 MHz) of the 2.5 GHz band. Instead, at the lower band edge the current OOBE levels would remain in place. WCAI also requested that the Commission allow a resolution bandwidth of 2 percent for mobile digital stations in section 27.53(m)(6). Similarly, Clearwire proposes that the existing resolution bandwidth of 1 percent be preserved at 2495-2496 MHz. Clearwire has proposed specific rule language that modifies Sections 27.53(m)(4) and (m)(6) to implement this compromise.

Clearwire explained that its proposed modification addresses and resolves the concerns expressed by Globalstar Corporation ("Globalstar") and the Engineers for the Integrity of Broadcast Auxiliary Services Spectrum ("EIBASS") in their comments to this proceeding while also providing significant benefits to Clearwire and other licensees in the 2.5 GHz band as they seek to deploy advanced mobile devices using larger bandwidths and achieving higher data rates. Clearwire urged the Commission to embrace this compromise proposal and adopt the modifications to Section 27.53(m).

Pursuant to Sections 1.1206(b)(2)(i) and 1.49(f) of the Commission's Rules, this notice of *ex parte* communication is being filed electronically. If you have any questions regarding this matter, please do not hesitate to contact the undersigned at 202-351-5033.

Sincerely,

By: /s/ Cathleen A. Massey

cc(w/att): Stephen Buenzow
Chris Helzer
Tom Peters
John Schauble
Blaise Scinto
Melissa Tye
Nancy Zaczek
Stephen Zak

Clearwire

4G Device Out of Band Emissions and Larger Channel Bandwidths

October 18, 2012

WCAI and Clearwire Positions

- **Growth of 4G services requires more throughput, capacity and efficient use of spectrum.**
  - Monthly tonnage on Clearwire network has grown by 3X over the past year.
  - Wider channel bandwidths allow more efficient use of spectrum, provide greater throughput and speeds to the end user.
- **Current FCC device emission masks are too restrictive to accommodate a broad family of mobile devices using large bandwidths and achieving high data rates.**
  - Multi-mode/multi-radio smartphone designs require reasonable tradeoffs between size, battery life and performance.

Globalstar Concern: Interference to MSS

- **BRS1 operates today on a co-primary, co-channel basis with Globalstar and BAS Channel A10 without interference from devices.**
  - CLWR currently operates WiMAX and pre-WiMAX technologies in the 2496-2500 band and has not received ANY interference complaints.
- **Globalstar analyses apply worst case device operating conditions across a 4G network.**
  - Applying Globalstar's methodology and the current FCC mask results in required separation distances of 2 km for 2483.5-2490.5 MHz and 7 km 2490.5-2495 MHz. This suggests they cannot co-exist today.
  - Globalstar's analysis uses a pessimistic free space path loss model to characterize mobile to mobile interference.
  - Typical 4G mobile devices use power control algorithms to minimize intra-system interference and maximize battery life.
  - Globalstar's operations are likely to be in rural areas.

EIBASS Concern: Interference to BAS A10 and A9

- **BRS1 operates today on a co-primary, co-channel basis with Globalstar and BAS Channel A10 without interference from devices.**
  - CLWR currently operates WiMAX and pre-WiMAX technologies in the 2496-2500 band and has not received interference complaints.
- **Probability of 4G mobile operating at full power in the immediate vicinity of an A10 or A9 receiver is unlikely.**
  - BAS receivers will typically be outdoors where 4G mobiles will not need to operate at full power.
- **Very few channel A10 facilities exist.**

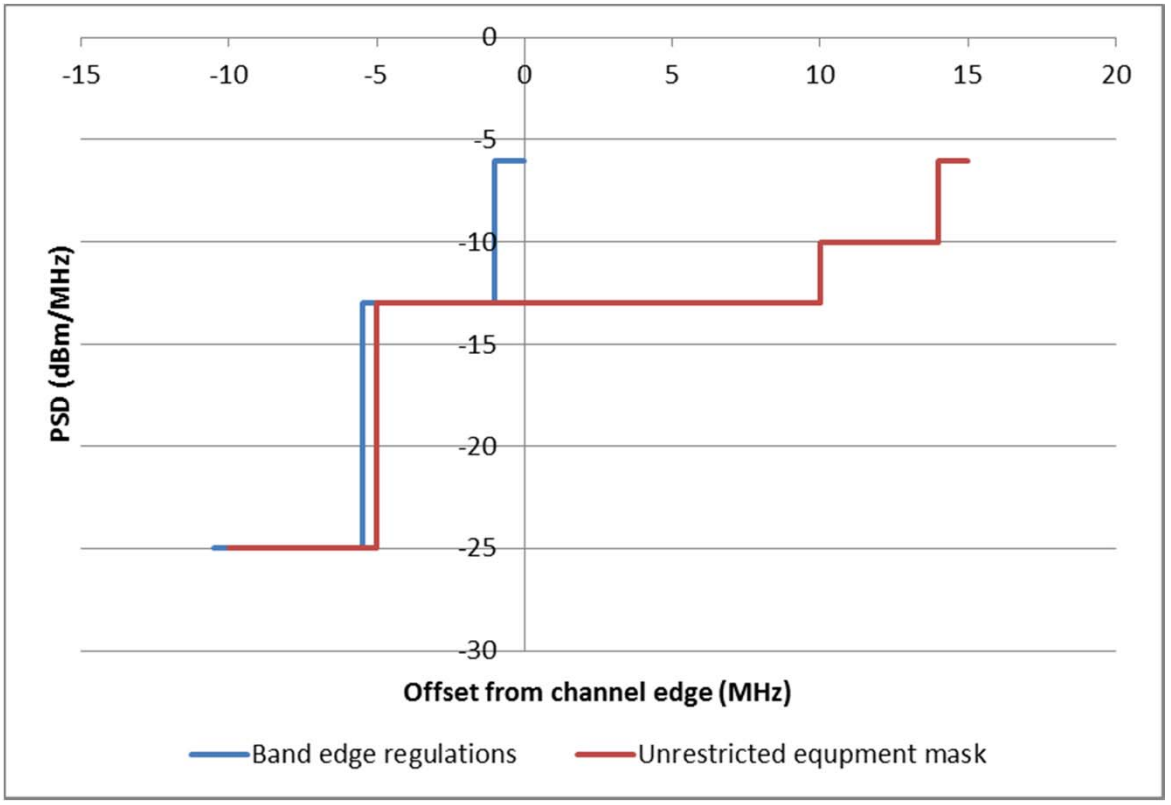
Solution to Address Globalstar and EIBASS Concerns

- **Allow proposed OOBE changes, with the restriction that the current FCC rules must apply at the lower band edge only**

- **Net result:**
  - GlobalStar and EIBASS see no change in protection afforded by FCC regulations
  - BRS/EBS able to operate UEs at optimal power in the majority of BRS/EBS band; only operations on the lowest channel will be impacted
  - BRS/EBS will use the lowest channel for capacity, rather than coverage
  - BRS/EBS will be able to support international roamers coming to USA with Band 38 compliant devices

Example operation

- For 20MHz channel operation, then for any channel that has a lower edge >15MHz from 2496MHz, BRS/EBS can operate without restrictions



- In this scenario, any operation in the range immediately above 2496MHz would have to be restricted to ensure the band edge mask is met

Clearwire

Benefit to BRS/EBS operators

- Except for the lower most channel, operators will be able to deploy Band 41 compliant equipment with no restrictions on operating performance
- Operators will have a roadmap to scale, using carrier aggregation, beyond 20MHz channels
- It will be possible to use support inbound international roamers from regions & countries that have adopted licensing based on the Band 7/38 framework

Proposed Rule Language**

- (4) For mobile digital stations, the attenuation factor shall be not less than 40~~3~~ + 10 log (P) dB at the channel edge, 43 + 10 log(P) dB at 5 MHz from the channel edges, and 55 + 10 log (P) dB at X~~5.5~~ MHz~~megahertz~~ from the channel edges where X is the greater of 6 MHz or the actual emission bandwidth as defined in 27.53(m)(6). In addition, the attenuation factor shall not be less than 43 + 10 log (P) dB at 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.
-
- (6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed; for mobile digital stations, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 MHz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified; or 1 MHz or 2 percent for mobile digital stations, except in the band 2495-2496 MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

**New language representing Clearwire's compromise proposal is highlighted in green. The red-line changes that are not highlighted are WCAI's original proposed revisions to the current rules that are consistent with Clearwire's compromise proposal.

Clearwire

Mobile Broadband Considerations for mobile OOBE

Systems R&D

Oct, 2012

EBS/BRS band is unique; it's wideband!

US Bands (Terrestrial Mobile BB)	3GPP Band Allocation (Uplink)	Largest deployable 4G Channel Bandwidth	FCC OOBE Limits
700	10 MHz (Band 13) 12 MHz (Band 17)	10 MHz	43+10logP until 2 MHz from ch edge 65+10logP @ 2 MHz from ch edge
850 MHz Cellular	25 MHz (Band 5)	10 MHz	43+10logP for all OOBE
1900 PCS	60/65 MHz (Band 2/25)	10 MHz	43+10logP for all OOBE
1700/2100 AWS	45 MHz (Band 4)	10 MHz	43+10logP for all OOBE
2600 EBS/BRS	194 MHz (Band 41)	Unlimited; 20 MHz LTE today, 40 MHz planned for 2014	43+10logP until 5.5 MHz from ch edge 55+10logP @ 5.5 MHz from ch edge

EBS/BRS band is unique (cont…)

- From a mobile broadband perspective, US cellular bands are “narrowband”, in terms of the total band allocation, and the maximum channel bandwidths which can be transmitted by a device within that band
- 2.6 EBS/BRS band is 3-19x larger than any other band, with channel bandwidths 2-4x wider than any other US band. It is the only US band that can accommodate contiguous channels of 20MHz or larger
- Yet, EBS/BRS is held to more stringent OOBE rules of 55+10logP @ 5.5 MHz away from channel edge which no other band has
- The 700 MHz band is a bit unique, in that it also has an additional OOBE limit of 65+10logP @ 2 MHz from edge… However, the 700 MHz band is a very special case – due to severe co-exist issues with public safety located only 2 MHz away. Also, unlike our 2.6 GHz band, the 700 MHz band is very narrow (only accommodate a single 10 MHz channel)
- Lower frequency radio transceiver equipment is easier to design for higher performance. At higher frequencies, such as 2.6 GHz, it’s much harder to cost effectively manage the transmitter non-linearities which produce OOBE (especially for new classes of low cost mobile Internet devices, aka “MIDs”).
- Developing new mobile broadband networks, while operating wider channels in higher frequency while requiring more stringent OOBE performance than narrow band channels at lower frequencies - violates basic radio physics

OOBE for Mobile BB; 3GPP is the standard

- Mobile Broadband technology has now converged into a single unified standard, LTE and LTE-A as defined by 3GPP
- 3GPP defines UE power classes, and maximum power reduction (MPR) values which dictate how much power a mobile terminal may transmit per modulation scheme
- In order to meet additional ACLR and regulatory spectrum emission requirements, 3GPP also defines the concept of additional maximum power reduction (A-MPR) values which may be signaled by the network to the UE to indicate that the UE shall reduce power. By default A-MPR value of 0 dB shall be used
- A-MPR values cause the UE to reduce output power by X dB in order to meet a pre-defined spectral mask requirement for a band. A-MPR values are always avoided, unless required by regulation, since the power reduction causes loss of coverage and capacity
- Network Signaling (NS) values are broadcast by LTE base stations to UE mobiles, to advertise which A-MPR value shall be used. NS values can be set on a per-BS (eNodeB) basis in the network

3GPP A-MPR/NS values for Band 41

- Band 41 is the 3GPP LTE band designated for the 2496-2590 MHz EBS/BRS spectrum in US
- The following NS masks may be used for Band 41 UE's:

NS Value	A-MPR Value (max dB)	FCC Limit	Notes
NS_01	0	N/A	Default, full power
NS_03	≤ 1	43+10logP for all OOBE	Default for most USA cellular/PCS bands. Virtually no loss of coverage/capacity
NS_04	3	43+10logP until 5.5 MHz from edge 55+10logP @ 5.5 MHz from edge	Specific for USA EBS/BRS OOBE. Significant loss of coverage/capacity